

WHAT IS CLAIMED:

- 5 1. A flexible pixel sensor element control system configured to readout and process analog values from a plurality of pixel sensor elements, the system comprising:
- an array of pixel sensor elements; and
- a readout and processing circuit configured to readout and process a plurality of analog values associated with a plurality of pixel sensor elements
- 10 within the array, the readout and processing circuit being configured to readout and process the analog values in a first mode and in a second mode.
2. The system of Claim 1, wherein the readout and processing circuit is adapted to read a plurality of pixel sensor elements in parallel.
3. The system of Claim 1, further comprising:
- 15 a first analog line storage unit, the first analog line storage unit being adapted to store a first line readout from the array; and
- a second analog line storage unit, the second analog line storage unit being adapted to store a third line readout from the array, wherein the readout and processing circuit averages a second consecutive line readout from the array
- 20 with the first line readout stored in the first analog line storage unit to produce a first red-green-blue (RGB) triplet, the readout circuit and processing averaging a fourth consecutive line readout from the array with the third line readout stored in the second analog line storage unit to produce a second RGB triplet.
4. The system of Claim 1, wherein the pixel sensor elements form a portion
- 25 of a charge coupled device.
5. The system of Claim 1, wherein the pixel sensor elements form a portion of a complementary metal oxide semiconductor device.
6. The system of Claim 1, wherein the pixel sensor elements are organized in a rectangular matrix.
- 30 7. The system of Claim 1, wherein the first mode comprises a full resolution readout mode.

8. The system of Claim 1, wherein the first mode comprises a sub-sampling readout mode.

9. The system of Claim 1, wherein the first mode comprises a window readout mode.

5 10. The system of Claim 1, further comprising a color filter overlaying at least a portion of the pixel sensor elements.

11. The system of Claim 10, wherein the color filter includes the colors of red, blue and green in a predefined pattern.

12. The system of Claim 10, wherein the color filter includes the colors of yellow, cyan and magenta in a predefined pattern.

13. The system of Claim 10, wherein the color filter comprises a Bayer color pattern.

14. The system of Claim 1, further comprising a micro-lenses layer.

15 15. The system of Claim 1, further comprising amplifiers adapted to amplify the analog values readout and processed by the readout and processing circuit.

16. The system of Claim 15, wherein the programmable gain amplifiers are implemented as a separate stage.

17. The system of Claim 15, wherein the programmable gain amplifiers are contained within a pixel circuitry of the array.

20 18. The system of Claim 15, wherein the programmable gain amplifiers are within a plurality of column buffers.

19. The system of Claim 1, wherein a first gain amplifier amplifies a first analog color component a first amount and a second amplifier amplifies a second analog color component a second amount, the first and second analog color components being readout by the readout and processing circuit.

20. The system of Claim 19, wherein the amplifiers are programmable gain amplifiers adapted to be adjusted by a controller.

21. The system of Claim 19, wherein the first gain amplifier provides a first transfer function for the first color component and the second gain amplifier provides a second transfer function for the second color component.

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22. The system of Claim 15, wherein at least one of the amplifiers is a summing amplifier that sums the analog values of two or more pixel sensor elements.

23. The system of Claim 1, further comprising a television coupled to said readout and processing circuit.

5 24. The system of Claim 1, further comprising a personal computer coupled to said readout and processing circuit.

25. The system of Claim 1, further comprising a display coupled to said readout and processing circuit.

10 26. The system of Claim 1, further comprising a camera coupled to said readout and processing circuit.

27. A flexible pixel sensor element control system that processes of a plurality of pixel sensor elements, the system comprising:

an array of pixel sensor elements; and

15 a control circuit, wherein the control circuit reads out and averages a first analog value readout from a pixel sensor element of a first color with a second analog value readout from a pixel sensor element of a second color to produce an average readout value.

28. The system of Claim 27, wherein the control circuit is adapted to read a plurality of pixel sensor elements in parallel.

20 29. The system of Claim 27, further comprising:

a first analog line storage unit, the first analog line storage unit being adapted to store a first line readout from the array; and

25 a second analog line storage unit, the second analog line storage unit being adapted to store a third line readout from the array, wherein the readout and processing circuit averages a second consecutive line readout from the array with the first line readout stored in the first analog line storage unit to produce a first red-green-blue (RGB) triplet, the readout circuit and processing averaging a fourth consecutive line readout from the array with the third line readout stored in the second analog line storage unit to produce a second RGB triplet.

30 30. The system of Claim 27, wherein the control circuit reads out and averages the first and second analog values on-the-fly.

31. The system of Claim 27, further comprising gain amplifiers amplifying the average readout value.

32. A method of processing in parallel a plurality of pixel sensor elements, the method comprising:

5 exposing an array of pixel sensor elements to light;
selecting a plurality of pixel sensor elements from an array of pixel sensor elements; and
reading in parallel a plurality of analog values associated with the plurality of pixel sensor elements.

10 33. A method of averaging two or more pixel sensor elements, the method comprising:

exposing an array of pixel sensor elements to light;
selecting a plurality of pixel sensor elements from an array of pixel sensor elements; and
15 averaging a first analog value associated with a first pixel sensor element and a second analog value associated with a second pixel sensor element within the array to produce an average readout value.

34. A pixel sensor element control system configured to readout and process analog values from a plurality of pixel sensor elements, the system comprising:

20 an array of pixel sensor elements;
a readout and processing circuit configured to readout and process a plurality of analog values associated with a plurality of pixel sensor elements within the array, the readout and processing circuit being configured to readout and process the analog values in a first mode and in a second mode.

25 a comparator circuit adapted to compare an address of a pixel sensor element currently being read by the readout controller with a stored list of defective pixel sensor addresses; and

at least one delay element for storing at least one previous analog pixel value read by the readout and processing circuit, wherein if the address of the current pixel sensor element matches a defective pixel address in the stored list,
30 the readout and processing circuit reads the previous analog pixel value.

35. A method of correcting defective pixel sensor elements during an analog readout, the method comprising:

comparing an address of a pixel sensor element currently being read by a readout control circuit with a stored list of defective pixel sensor addresses;

5 storing at least one previous analog pixel value read by the readout control circuit, wherein if the address of the current pixel sensor element matches a defective pixel address in the stored list, the readout control circuit reads the previous analog pixel value.